



Organised by **FISITA** 

17 – 21 May 2021



# Europe's braking technology conference & exhibition

**Final Programme**

 **brembo**

**HORIBA**  
Automotive

**LINK**

**oerlikon**

**TEIJIN**

**rimsa**

**AK**

fagorederlandgroup

**RENK**



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EuroBrake 2021 is organised by FISITA, the international membership organisation for the automotive and mobility systems engineering profession.

Established in 1948, FISITA links the national automotive engineering societies in 36 countries representing over 210,000 engineering professionals and organises the biennial FISITA World Congress, the annual World Mobility Summit and the FISITA PLUS Conference.

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# Welcome to EuroBrake 2021

**EuroBrake is the largest braking technology and strategy event in the world, providing a unique forum for companies to showcase innovative technology, products and services.**

We are delighted to welcome you to a new-look EuroBrake. The EuroBrake 2021 technical programme features a week of technical and networking sessions, with over 90 technical presentations, 20 technical sessions, posters, two panel sessions, and networking sessions.


As conferencing and business networking evolves in the wake of the COVID-19 pandemic, we have developed a new approach to delivering our annual EuroBrake event, ensuring that we are COVID-secure and fully future-proof.

We will deliver EuroBrake 2021 on the EuroBrake Virtual Content Delivery (VCD) platform, a user-friendly virtual conference platform which will showcase partner companies and provide unique networking opportunities for a truly immersive online experience. Through the online event platform, attendees can message, video call, and post to the forums, and build a personal agenda and experience. The platform can suggest people and companies with similar interests and products to improve networking opportunities.

We are excited to welcome back our colleagues from the rail industry, and the EuroBrake 2021 agenda includes three technical sessions, one keynote speaker and one panel session devoted to hot topics in the global rail industry. EuroBrake exists to connect braking industry experts and we look forward to providing the opportunity for cross-industry collaboration, knowledge sharing, and networking.

We are delighted that the EuroBrake Student Opportunities Programme (ESOP) returns to EuroBrake 2021; we welcome 50 international students to our fantastic community – a number of engaging sessions are scheduled throughout this week including a Welcome, Q&A, Round Table, Surgery Sessions and CV and career advice. ESOP students will also join EuroBrake sessions and are encouraged to network with delegates, sponsors and exhibitors. Thanks to the experts who are supporting ESOP.



  
**Jan Münchhoff**  
AUDI AG



  
**Chris Mason**  
CEO, FISITA



# Organisation

## Steering Committee

**Jan Münchhoff** – Audi AG, Chairman EuroBrake 2021  
**Harald Abendroth** – Consultant  
**Prof. David Barton** – University of Leeds  
**Prof. Yannick Desplanques** – University of Lille  
**Klaus Jäckel** – Daimler Truck AG  
**Prof. Dr.-Ing. Georg-Peter Ostermeyer** – TU Braunschweig  
**Dr. Ludwig Vollrath** – Formula Student Germany  
**Roberto Tione** – WABTEC-Faiveley  
**Gemma Wilkins** – FISITA – EuroBrake 2021 Project Manager

## EuroBrake Student Opportunity Programme 2021 Working Group

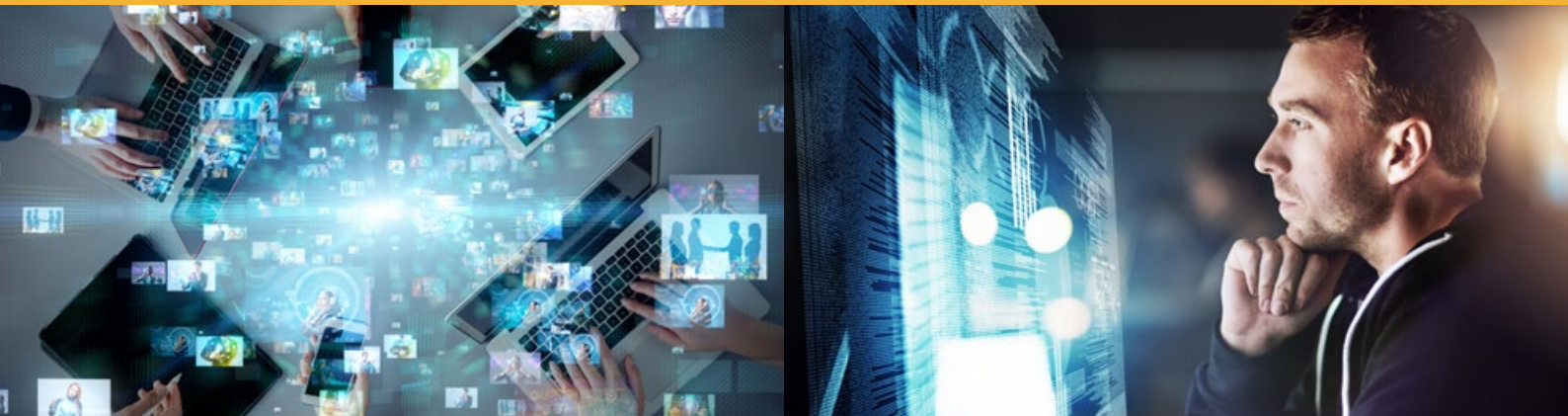
**Dr.-Ing. Kai Bode** – Audi AG  
**Dr.-Ing. Jens Bauer** – Continental  
**M.Sc. Jacek Kijanski** – TU Braunschweig  
**Fabian Limmer** – University of Leeds  
**Dr. Nils Perzborn** – ZF Group  
**Hannes Sachse** – IDIADA Fahrzeugtechnik  
**Aaron Völpe** – Volkswagen AG  
**Hayley Millar** – FISITA

## Advisory Board

**Prof. Jayashree Bijwe** – Indian Institute of Technology  
**Dr. Stefan Dörsch** – DB Systemtechnik GmbH  
**Prof. Philippe Dufrénoy** – University of Lille  
**Prof. John Fieldhouse** – JDF Consulting  
**Prof. Peter Filip** – Southern Illinois University Carbondale  
**Johannes Gräber** – Knorr-Bremse - Systeme für Schienenfahrzeuge GmbH  
**Dr. Theodoros Grigoratos** – European Commission, Joint Research Centre  
**Takashi Kudo** – Akebono Brake Industry Co. Ltd.  
**Ralph Lauxmann** – Continental AG  
**Michael Lingg** – Volkswagen AG  
**Loïc Lelièvre** – Flertex Sinter  
**Roy Link** – Link Engineering Co.

**Luca Martinotto** – ITT Friction Technologies  
**Manfred Meyer** – ZF Group  
**Prof. Dr. Jiliang Mo** – Southwest Jiaotong University  
**Parimal Mody** – Brake and Friction Expert  
**Dr. Rainer Müller-Finkeldei** – Daimler Truck AG  
**Tony Nicol** – Meritor  
**Prof. Dr. Masaaki Nishiwaki** – Kanagawa Institute of Technology  
**Franck Poisson** – SNCF  
**Dr. Seong Kwan Rhee** – SKR Consulting, LLC  
**Yukihiro Shiomi** – Toyota Motor Corporation  
**Fabio Squadrani** – Applus IDIADA  
**Stephan Stass** – Robert Bosch GmbH

The EuroBrake Advisory Board consists of representatives from major companies and research institutions that lead the field in braking technology today. The Advisory Board provides strategic advice and helps to ensure that EuroBrake continues to meet the needs of the international braking community.



# What to expect at EuroBrake 2021

**As a registered attendee, you will be able to access the virtual conference environment from 4 May to start planning your event. Be sure to explore the virtual event platform (VCD), complete your profile setup and start building your network with connections. A complete profile is essential to how you present yourself and interact with other participants.**

Check out the Content Hub for technical content and download papers, posters, videos, sponsored content and more. Visit the agenda to add sessions to your personal schedule and to find the 'watch now' or 'replay' links to the sessions.

The EuroBrake virtual event platform offers many networking benefits...

In the virtual event site, you will be able to:

- Update your profile to show people what you are interested in at EuroBrake
- Tell people if you have a product or some research to share
- Set your personal agenda with times you are available to meet/network and times you are busy
- Select all the sessions you would like to attend and build your personal agenda
- Download technical papers, posters, videos and more
- Private message other attendees and set up video calls within the platform (including group calls)
- Network with speakers
- View special exhibitor and sponsor content and connect with these groups via messaging and video calls
- Chat to colleagues in the open chat forums
- Watch sessions back on-demand if you missed them live

## How 'matchmaking' works in the EuroBrake VCD

EuroBrake attendees who access the VCD event will be able to choose interests/tags which apply to them, along with interests/tags that they are seeking information about for the purpose of matchmaking. The data collected will be used to make "smart" suggestions on who attendees may benefit from meeting with.

Further information on setting up and using the platform, and its smart networking functions, can be found in the 'Need Help?' tab of the VCD.







# What to expect at EuroBrake 2021

## Technology and Access Requirements

To get the best out of the platform, we recommend you check you are set up and ready to go using the hints below.

- **The optimum browser to use is the latest version of Google Chrome. Other browsers will work, except Internet Explorer which is no longer supported**
- **We will be using WebinarJam and Microsoft Teams to run the live sessions – before you access the session, please check that your company firewalls allow you to use these platforms (speakers and moderators will be offered 'Tech Check' sessions)**
- **Ensure you have a fast and reliable internet connection**
- **The virtual event platform is not optimised for use on a mobile phone due to the amount of content that is available - for the best result, access on a laptop/desktop computer**
- **If you intend to participate in one-to-one meetings, ensure you use a computer with a working camera and microphone**
- **All times are in CEST**
- **In some cases the automated emails sent from the EuroBrake Team via the event platform may not display in your inbox – please remember to check your Spam or Junk Mail folder for event messages in case this happens**

## On-Demand Posters and Presentation Slides

Be sure to check out the on-demand posters and pitch presentations in the Content Hub. You can also watch back any of the sessions by using the replay links in the agenda (links will be added the day following the session). Speaker slides will be uploaded to the Content Hub post-event and you will be able to access the EuroBrake VCD for 3 months after the event.

## Last minute conflict or want to watch again?

Don't worry – you can watch the sessions you missed on-demand. The virtual platform will be available for 3 months following the event.



Once you have registered and then activated your account, you may visit the platform at any time by going to:

<https://eurobrake2021.vcd-eventsforce.com/>

# EuroBrake 2021 Overview

## All times in CEST

Monday 17 May 2021		
10:00 – 11:00	EuroBrake Kick-Off: Meet the Key Players	
12:00 – 13:40	ACB	Advanced Coatings for Brake Components
	AMM	Advanced Manufacturing and CO <sub>2</sub> Mitigation
14:00 – 14:30	Meet the speakers – Advanced Coatings for Brake Components & Advanced Manufacturing and CO2 Mitigation	
15:00 – 16:40	CLF	Challenges around Long-Life Friction Couples
	IBR	Innovative Brake Rotors
17:00 – 17:30	Meet the speakers – Challenges around Long-Life Friction Couples & Innovative Brake Rotors	
17:30 – 19:30	Poster Session	
Tuesday 18 May 2021		
09:00 – 10:15	EuroBrake Keynote Session	
11:00 – 12:40	BCE	Brakes and Components in EV
	FOF	Fundamentals of Friction
13:00 – 13:30	Meet the speakers - Fundamentals of Friction & Brakes and Components in EV	
14:00 – 15:40	EFF	Environmentally Friendly Formulations
	IBB	Intelligent Braking and Braking Control (Rail)
16:00 – 16:30	Meet the speakers - Intelligent Braking and Braking Control (Rail) & Environmentally Friendly Formulations	
16:30 – 18:30	ISO Working Group - Brake Linings and Friction Couples	
Wednesday 19 May 2021		
09:00 – 10:40	BEM1	Brake Emissions Macroscopic Part 1
	MMD	Materials, Manufacturing and Design (rail)
11:00 – 11:30	Meet the speakers - Materials, Manufacturing and Design (rail) & Brake Emissions Macroscopic Part 1	
11:30 – 13:10	BEM2	Brake Emissions Macroscopic Part 2
	NVHV	NVH Vehicle Applications
13:30 – 14:00	Meet the speakers - Brake Emissions Macroscopic Part 2 & NVH Vehicle Applications	
15:00 – 16:40	Strategy Panel - Chassis Systems – a new approach to OEM and Tier 1 collaboration?	
Thursday 20 May 2021		
09:00 – 10:40	NVHF	NVH Fundamentals
	STP-	imulation, Testing, Innovative Development Processes (rail)
11:00 – 11:30	Meet the speakers - NVH Fundamentals & Simulation, Testing, Innovative Development Processes (rail)	
11:30 – 13:10	BEML	Brake Emissions Microscopic Level
13:30 – 14:00	Meet the speakers - Brake Emission Microscopic Level	
14:00 – 15:40	ESR	EuroBrake meets Shift2Rail
Friday 21 May 2021		
09:00 – 10:40	BCN	Brake Control
	IRM	Innovative Raw Materials
11:00 – 11:30	Meet the speakers - Brake Control & Innovative Raw Materials	
12:00 – 13:40	ART	Advances in Rotor Technology
	HPP	High Performance Products
14:00 – 14:30	Meet the speakers - High Performance Products & Advances in Rotor Technology	

# Technical Programme

Monday 17 May 2021



**10:00 – 11:00 CEST**

EuroBrake Kick-Off Session

## Meet the Key Players

**Chair:**

**Martin Kahl** – FISITA

Following an introduction to EuroBrake 2021 from the event Chair, Jan Münchhoff of AUDI AG, EuroBrake 2021 will open with a new feature – the EuroBrake Leadership Discussion, moderated by FISITA CEO Chris Mason and featuring the heads of the world's three major braking conferences.

Running under the title, "From stopping vehicles to regenerative braking – the evolution of brake technology," this panel discussion will feature Jan Münchhoff, AUDI AG & Chair of EuroBrake 2021; Roy Link, CEO Link Engineering co., and Chair of the SAE Brake Colloquium; and Seong Rhee, President, SKR Consulting LLC and Executive Advisor, AsiaBrake.

The discussion will cover a range of topics, including:

- **Influence of CASE (connectivity, automation, sharing, and electrification) on braking technology**
- **Regulation of brake emissions**
- **What and how industries such as the automotive industry can learn from other sectors**
- **The rise of online and hybrid events**
- **The evolution of braking – what can we expect next, and when?**

The discussion will be followed by an introduction to our 2021 Gold sponsor companies, and guidance on how delegates can connect with the key people they would like to meet during EuroBrake 2021.





# Technical Programme

Monday 17 May 2021

## 12:00 – 13:40 Technical Sessions

### ACB – Advanced Coatings for Brake Components

Chair: **Refaat Malki**  
Meritor, Inc.

Co-chair: **Prof. Dr. Suman Shrestha**  
Keronite International Ltd

EB2021-STP-020

#### Preliminary Comparisons of Particulate Emissions Generated from Different Disc Brake Rotors

**Asmawi Sanuddin**, Prof. David Barton,  
Dr. Peter Brooks, Dr. Carl Gilkeson,  
Dr. Shahriar Kosarieh  
University of Leeds

**Prof. Dr. Suman Shrestha**  
Keronite International Ltd  
United Kingdom

EB2021-STP-012

#### Lab-Scale Anodization of Prototype Brake Calipers

**Dr. Federico Bertasi**, **Dr. Marco Bandiera**,  
Dr. Alessandro Mancini, Dr. Arianna Pavesi,  
Dr. Andrea Bonfanti  
Brembo S.p.A

**Prof. Massimiliano Bestetti**  
Politecnico di Milano  
Italy

EB2021-MDS-003

#### Novel Computationally Designed Brake Disc Coatings for Thermal Spray and Extra High-Speed Laser Cladding

**Dr.-Eng. Hossein Najafi**, **Dr.-Eng. Arkadi Zikin**  
Oerlikon  
Switzerland

**Ing. Cameron Eibl**  
Oerlikon  
United States

**Ing. Franco Arosio**, **Thilo KrahTomala**  
Oerlikon  
Germany

14:00 – 14:30 Meet the Speakers

### AMM – Advanced Manufacturing and CO2 Mitigation

Chair: **Dr. Wolfgang Schröer**  
DRIV Inc.

Co-chair: **Karsten Fischer**  
Fischer Consulting

EB2020-MDS-011

#### Fabricated Brake Pads Using Non-firing Ceramics

**Masato Furuta**, Yukio Nishizawa,  
Masaru Yagihashi  
ADVICS CO.,LTD.

**Masayoshi Fuji**  
Nagoya Institute of Technology  
Japan

EB2020-MFM-004

#### CO2 Foot Print Reduction in Brake Pad Industry

**Karsten Fischer**  
Fischer Consulting  
Germany

EB2020-MFM-010

#### Friction Pad Manufacturing with Integrated Quality Control

**Karsten Fischer**  
Fischer Consulting

**Andreas Meyer**  
AUT-FIT Automatisierungstechnik GmbH  
Germany

EB2021-STP-014

#### Crack Detection in Friction Material of Brake Pads

**Ing. Juan Jose Bustos**,  
**Dr.-Ing. Alex Van den Bossche**  
GrindoSonic  
Belgium

14:00 – 14:30 Meet the Speakers

## 15:00 – 16:40 Technical Sessions

### CLF – Challenges Around Long-Life Friction Couples

Chair: **Sebastian Fischer**  
Continental AG

Co-chair: **Dr. Agusti Sin**  
ITT Friction Technologies

EB2021-EBS-012

#### Long-life Friction Couples

**Dr. Agusti Sin**  
ITT Friction Technologies  
Italy

**Dr.-Ing. Sebastian Fischer**  
Continental  
Germany

EB2021-MDS-006

#### Lifetime Protection of Iron Casted Brake Discs for Electric Vehicles through Advanced Heat Treatment Technology

**Ing. Franco Arosio**  
Oerlikon  
Germany

**Dr.-Ing. Ingo Lange**  
Oerlikon  
Switzerland

EB2020-STP-016

#### Changing Properties of Brake Pads and Discs at Room Temperature and During Testing

**Meechai Sriwiboon**, **Kritsana Kaewlob**  
Compact International (1994) Co, Ltd.  
Thailand

**Seong Rhee**  
SKR Consulting  
United States


EB2020-STP-038

#### FE-Modeling for Brake Squeal Simulation with Uncertain Parameters

**Dr.-Ing. Michael Klein**  
INTES GmbH  
Germany

17:00 – 17:30 Meet the Speakers

## Key to Technical Sessions

-  Full written papers will be available for attendees to download from the online event platform pre-event and for three months post-event.
-  Oral-only presentation. PPT Presentations, where permission is given, slides will be shared in PDF format on the event platform after the event.
-  Poster-only presentation.

# Technical Programme

Monday 17 May 2021

15:00 – 16:40 **Technical Sessions**

## IBR – Innovative Brake Rotors

Chair: **Dr. Marko Tirovic**  
Cranfield University

Co-chair: **Deaglán Ó Meachair**  
Brake Batter

EB2020-MDS-012

### Metal-Ceramic Hybrid Brake Disc: Concept, Prototype, Testing

**Dipl.-Ing. Thorsten Opel (né Balzer),**  
Dr. Nico Langhof, Prof. Dr.-Ing. Walter Krenkel  
University of Bayreuth  
Germany

EB2021-EBS-002

### Topology Optimisation of an Automotive Disc Brake Rotor to Improve Thermal Performance and Minimise Weight.

**Ahmed Oshinibosi,** Prof. David Barton,  
Dr. Peter Brooks, Dr. Carl Gilkeson  
University of Leeds  
United Kingdom

EB2021-FBR-006

### On Thermal Diffusivity of Selected Gray Cast Irons and its Impact on Friction Performance of Automotive Brakes

**Rohit Jogineedi,** Vishal Reddy Singireddy,  
Dr. Peter Filip  
Southern Illinois University Carbondale  
**Sai Krishna Kancharla**  
PureForge  
United States

EB2021-STP-009

### Universal Brake Disc Analysis with New High-speed Thermographic Systems for Automated Test Bench Solutions

**Dipl.-Ing. Steffen Sturm**  
InfraTec  
Germany

17:00 – 17:30 **Meet the Speakers**



## Poster Session

Monday 17 May 2021

17:30 – 19:30

The EuroBrake poster session is an on-demand event in 2021. Posters, pitch videos and technical papers will be available to download and watch from the Content Hub during the event and for three months post-event.

Poster presenters will be available for attendees to contact using the online platform at any point, and specifically during the Poster Session hours of 17:30 – 19:30 CEST on Monday 17 May.

### Best Poster Prizes

Posters will be judged by a panel of experts from the EuroBrake Steering Committee, FISITA and others invited from both industry and academia.

The top three posters will be awarded a prize and recognised at an online ceremony later in 2021.

- 1st place – EUR 500**
- 2nd place – EUR 300**
- 3rd place – EUR 150**


# Poster Session

**Monday 17 May 2021**

17:30 – 19:30

Chair: **Prof. David Barton**  
University of Leeds

Chair: **Parimal Mody**  
Automotive Brake and Friction Expert

EB2020-EBS-007   
**Gear Optimization for Noise Reduction of EPB Actuator**  
**Sangbum Kim**, Inuk Park, Changhun Park  
Hyundai Mobis  
Republic of Korea


EB2020-FBR-015   
**Simulation Studies of a Ventilated Brake Disc with Variable Friction Plate Thickness**  
**Dr. Qianjin Yang, Fulin Gai, Hui Yu,**  
**Liqiang Song, Baozhi Zhang**  
Yantai Winhere AutoPart Manufacturing Co., Ltd  
China


EB2020-IBC-015  
Posteronly  
**Terra Dura™ – 100% Sealed Dry Disc Brakes; Helping to Create a Sustainable Braking Future**  
**Tony Van Litsenborgh**, David Newcomb  
Advanced Braking Technology Ltd  
Australia


EB2020-MDS-030   
**Studying the Influence of the 3rd-body Formation on the Tribological Properties of High-Performance Friction Materials**  
**Felix Wich**, Dr. Nico Langhof,  
Prof. Dr.-Ing. Walter Krenkel  
University of Bayreuth  
Germany


EB2020-STP-004   
**Mode Split Brake Disc Design Optimization for Squeal and Thermal Judder**  
**Dr. Jinghan Tang**, Jibran Bamber  
Jaguar Land Rover  
United Kingdom

EB2020-STP-005   
**Brake Disc Vane Modification Effect in the Enhancement of Heat Transfer for Heavy Duty Vehicles**  
**Dilek Bayrak Akça, Öznur Çetin,**  
**Dipl.-Ing. Yasin Hacısalıhoğlu**  
Ford Otosan  
**Dr.-Ing. Ibrahim Can Guleryüz,**  
**Dipl.-Ing. Barış Yılmaz**  
Ege Fren  
Turkey

EB2020-STP-010   
**Operational Bending and Torsion of a Vehicle Body Under Brake Judder Loads**  
**Dr. Juan J. Garcia**, Bernat Ferrer,  
**Fabio Squadrani**  
Applus IDIADA  
Spain


EB2020-STP-049   
**Preliminary Study on Developing a Methodology of Friction Behaviour under Extremely Low Sliding Speed**  
**Aihong Li**, Kang Li, Jianguo Zhang,  
Jianghong Long, Otto Schmitt  
Zhuhai Glory Friction Material Co., Ltd.  
Germany


EB2020-STP-051   
**Streamlining Brake Squeal DOE Simulations**  
**Dipl.-Ing. Ioannis Karypidis**  
BETA CAE Systems  
Greece  
**Ing. Federico Zaramella**  
BETA CAE Italy Srl  
Italy


EB2021-EBS-005   
**Investigation of Tribological Behavior and Airborne Emissions During the Bedding Stage**  
**Ana Paula Gomes Nogueira,**  
**Stefano Candeo**, Prof. Dr. Giovanni Straffellini  
University of Trento  
**Dr.-Eng. Mara Leonardi**  
Brembo S.p.A  
Italy


EB2021-EBS-010   
**Mechanism of Particles Released into the Environment That ss Formed by Brake Wear on Friction Surfaces**  
**Ir. Saša Vasiljević**  
Academy of Professional Studies Šumadija,  
Department in Kragujevac  
**Prof. Dr. Jasna Glišović, Ir. Nadica Stojanović,**  
**Ir. Ivan Grujić**  
University of Kragujevac  
Serbia


EB2021-MDS-005   
**Design and Development of Brake Caliper using Additive Manufacturing**  
**Swapnil Kumar**  
University of Louisville  
United States  
**Dr. Thundil Karuppa Raj Rajagopal**  
Vellore Institute of Technology  
India

EB2021-STP-008   
**Numerical Modelling of Composite Brake Pad Operational Deflection Shapes**  
**Mohammad Ravanbod**  
University of Bradford  
United Kingdom

EB2021-IBC-008   
**Brake Actuation and Foundation Trends Driven by Electrification and Autonomous Driving**  
**Patricio Barbale**  
IHS Markit  
Italy

EB2020-MDS-004   
**LMD & High-Speed Laser Cladding – Perspectives for Brake Discs**  
**Dr. Sabrina Vogt, Marco Göbel,**  
**Florian Hermann**  
TRUMPF Laser und Systemtechnik GmbH  
Germany

EB2021-STP-017   
**Automatic Pad Thickness Variation Tester**  
**Seung Bok Kim**  
Sun Bee Instruments, Inc.  
Republic of Korea

EB2021-STP-018   
**Test Bench Brake Caliper with Maximum Power Range**  
**Armin Diller, Jürgen Gaßner**  
RENK Test System GmbH  
Germany



# Keynote Session

Tuesday 18 May



09:00 – 10:15 CEST

Chair:

Jan Münchhoff – AUDI AG

## Keynote One

### Regulation Activities for Brake Emissions

**Duncan Kay** – Head of Vehicle Engineering, International Vehicle Standards, UK Government Department for Transport

Health experts say there is no safe limit for particulate emissions in the air that we breathe, and road transport is a major contributor to this problem. The good news is that improved engine design and exhaust aftertreatment technology have dramatically reduced particulate emissions from road vehicles. As a result, the majority of road transport particulates are now the result of brake, tyre and road wear. So what should legislators and the industry do to address this?

## Keynote Two

### What can the automotive braking community learn from rail, and vice versa?

**Dr. Stefan Dörsch** – DB Systemtechnik GmbH

**Johannes Gräber** – Knorr Bremse SFS GmbH

**Roberto Tione** – Faiveley Transport / Wabtec

The global automotive industry is facing major challenges on a range of topics, including several technical issues which are well known to the railway sector. This presentation aims to provide a short overview of techniques and general principles in the railway sector which could act as the basis for potential further collaborations between the two sectors.

#### Brake Management

In terms of brake management, the sophisticated interaction between a conventional braking system and the use of the traction motor as a generator is an essential factor. The hierarchical interaction of different braking systems, including electro-dynamic, regenerative braking is well established in the railway industry, and a case study of DB AG's ICE 3 will be used to illustrate this interaction.

#### Autonomous driving and its implications for braking systems

Since the introduction of signalling systems, railway operation has been externally controlled, with a strong link to the braking performance of trains. When it comes to autonomous driving, the automotive braking community will face the same challenges. In the rail sector, the organisation of train movements over the track is classically regulated, typically controlled by optical signals. The most up to date version of the European Train Control System (ETCS) requires no signals and limited trackside equipment, enabling the automated driving of trains.

This presentation will provide an overview of the technical principles and safety requirements for such a system, and then focus on the retroactive effects on train brake control, which must meet the objective of robust and optimised operational control. The reproducibility of braking distances under a wide range of weather conditions, for example, plays a major role here. Braking in the railway sector is closely connected to the guiding of trains along the track, and there are opportunities to explore parallels with automated vehicles.

#### Regular brake test

Finally, daily brake performance testing is a long-established practice in the rail sector, to determine the continuity of the brake control line as well as the readiness of individual brake-generating elements. In principle, similar procedures will be required for autonomous driving in the absence of a driver carrying out legally required brake checks.

The presentation will conclude by encouraging a dialog between braking specialists in the railway sector with those in the automotive sector, in order to benefit both sectors.

# Technical Programme

Tuesday 18 May 2021

11:00 – 12:40 **Technical Sessions**

## BCE – Brakes and Components in EV

Chair: **Tobias Ell**  
EvoBus GmbH

Co-chair: **Dr. Hans-Jörg Feigel**  
Mando Halla

EB2020-IBC-006  
**ACHILES-Project – Requirements and Design Recommendations for Optimized Wheel Brakes of Battery Electric Vehicles**

**Dr.-Ing. Sebastian Gramstat,**  
**Dr.-Ing. Stefan Heimann,**  
**Christopher Hantschke**  
AUDI AG

**Paul Linhoff, Sebastian Müller**  
Continental Teves AG & Co. oHG

**Oliver Biewendt, Michael Lingg**  
Volkswagen AG  
Germany

EB2020-STP-006  
**Development of a Thermal Simulation Tool for Early Sizing of Nonstandard Brake Concepts**

**Dr.-Ing. Gerrit Nowald, Dr.-Ing. Benjamin Siegl**  
Continental Teves AG & Co.oHG  
Germany

EB2020-IBC-011  
**Brake-by-Wire Technology for Future Generations of Battery Electric Vehicles – the EVC1000 Project**

**Dr.-Ing. Sebastian Gramstat,**  
**Dr.-Ing. Stefan Heimann, Martin Angel**  
Audi AG, Germany

**Matteo Mazzoni, Benjamin Szewczyk**  
Brembo S.p.A.  
Italy

EB2020-IBC-025  
**Vehicle Impacts Introducing Electromechanical Brakes**

**Daniel Herven, Anders Nilsson**  
Haldex Brake Products AB  
Sweden

EB2020-STP-064  
**Simulation of Regenerative Brake Blending Using Hardware-in-the-Loop on an Inertia Dynamometer**

**Carlos Agudelo**  
Link Engineering Co  
**David Antanaitis**  
General Motors, United States

**Marco Zessinger**  
Link Europe GmbH

**Michael Peperhowe**  
dSPACE GmbH, Germany

13:00 – 13:30 **Meet the Speakers**

## FOF – Fundamentals of Friction

Chair: **Prof. Philippe Dufrénoy**  
University of Lille

Co-chair: **Dr. Kai Bode**  
Audi AG

EB2021-FBR-008  
**Particles Emissions and Understanding the Braking Tribological Circuit**

**Dr. Edouard Davin, Dr. Laurent Coustenoble,**  
**Prof. Yannick Desplanques**  
Centrale Lille

**Dr. Arnaud Beaurain**  
Univ. Lille, France

EB2021-FBR-009  
**Relationship between Mechanical Behavior and Microstructure Evolution of Sintered Metallic Brake Pad under the Effect of Thermomechanical Stresses**

**Dr. Hoang Long Le Tran,**  
**Dr. Anne-Lise Cristol**  
Centrale Lille

**Dr. Vincent Magnier, Dr. Jérôme Hosdez**  
University of Lille  
France

EB2020-FBR-038  
**Multi-physics Experiments and Numerical Simulation Highlighting the Role of Contact Surface Evolution on Squeal Occurrence**

**Dr. Jean-François Brunel, Dr. VanVuong Lai,**  
**Prof. Philippe Dufrénoy**  
University of Lille

**Ing. Igor Paszkiewicz**  
Paszkiewicz

**Prof. Maxence Bigerelle**  
LAMIH, France

EB2021-FBR-001  
**A Comparison between Stationary and Dynamic Wear Tests of Brake Pads**

**Jacek Kijanski,**  
**Prof. Dr.-Ing. Georg-Peter Ostermeyer**  
TU Braunschweig  
Germany

EB2021-STP-007  
**Adhesion-related Wear Dust Transport**

**Prof. Dr.-Ing. Georg-Peter Ostermeyer,**  
**Chengyuan Fang, Felix Rickhoff**  
TU Braunschweig  
Germany

13:00 – 13:30 **Meet the Speakers**



# Technical Programme

Tuesday 18 May 2021

14:00 – 15:40 **Technical Sessions**

## EFF – Environmentally Friendly Formulations

Chair: **Dr. Sylvie Descartes**  
INSA Lyon

Co-chair: **Dr. Raffaele Gilardi**  
Imerys Graphite & Carbon

EB2021-MDS-007   
**Friction Materials: Best Practices for the Evaluation of Corrodibility and Corrosion Mechanism**

**Dr. Federico Bertasi**, Dr. Marco Bandiera,  
Dr. Arianna Pavesi, Dr. Andrea Bonfanti,  
Dr. Alessandro Mancini  
Breibo S.p.A  
Italy

EB2020-FBR-013   
**Wear Debris Emissions and Antimony Trisulfide Tribochemistry**

**Dr. Roberto Dante**, Ing. Edoardo Cotilli, Ing.  
Michael Conforti, Ing. Mario Cotilli  
Quartz S.r.l.s.u.  
Italy

Ing. John Oleary  
Applus IDIADA  
United Kingdom

EB2021-MDS-009   
**Enhanced Performance of Eco-friendly Brake-pads by Using Plasma Treated Metallic Particles**


**Navnath Kalel**, Prof. Dr. Jayashree Bijwe,  
Prof. Dr. Ashish Darpe  
IIT Delhi  
India

16:00 - 16:30 **Meet the Speakers**

## IBB – Intelligent Braking and Braking Control (Rail)

Chair: **Dr. Stefan Dörsch**  
DB Systemtechnik GmbH

Co-chair: **Johannes Gräber**  
KnorrBremse


EB2021-MFM-003   
**Railway Brake System in Nordic Countries Application in Sweden's Challenges and Constraints**

**Denis Emorine**  
ALSTOM  
Germany

EB2021-IBC-007   
**METROFLEX: A Step Towards a Safer Railways Brake Control**  
**Fabio Ferrara**, Astengo Federico, Matteo Frea  
Wabtec Corporation  
Italy

EB2021-STP-019   
**Performance Evaluation for Wheel Slide Protection System with Factor Analysis in Simulation**

**Daisuke Hijikata**  
Railway Technical Research Institute  
Japan

EB2021-STP-003   
**Benchmarking the Adaptive Wheel Slide Protection**

**Luc Imbert**, Matteo Frea  
Wabtec Corporation  
Italy

EB2021-IBC-011   
**Application of UIC 421 procedure to Freight Trains fitted with a Distribute Power System**

**Luciano Cantone**  
University of Rome "Tor Vergata"  
Italy

**Robert Karbstein**  
DB Systemtechnik GmbH  
Germany

16:00 - 16:30 **Meet the Speakers**

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# Technical Programme

Tuesday 18 May 2021



16:30 – 18:30 CEST

ISO Working-Group

## Brake Linings and Friction Couples

### Chairs:

**Dr. Sebastian Gramstat** – AUDI AG, Convenor WG10

**Dr.-Ing. Jaroslaw Grochowicz** – Ford Werke GmbH

### Introduction

#### Overview of Projects ISO WG10

**Dr.-Ing. Sebastian Gramstat**

AUDI AG

#### EB2020-MDS-005

#### Road Vehicles – Friction-related Characteristics and Test Methods for Brake Discs

**Dr.-Ing. Sebastian Gramstat**

Audi AG

Germany

**Carlos Agudelo**

Link Engineering Co.  
United States

#### EB2020-MFM-007

#### Standardization of Drag Mode Friction Test for Hydraulic and Pneumatic Vehicle Brakes

**Nicolae Penta**

TMD Friction Romania  
Romania

#### EB2021-MFM-002

#### "Road Vehicles - Brake Linings Friction Materials - Visual Inspection" - ISO DIS Upgrade

**Andreas Jandl**

VRI – Verband der Reibbelagindustrie e.V.  
Germany

#### EB2020-MFM-013

#### ISO 6310 Compressive Strain Test Methods

**Carlos Agudelo**

Link Engineering Co.  
United States

#### EB2020-STP-063

#### SAE Standards Update

**Carlos Agudelo**

Link Engineering Co.  
United States

#### EB2020-EBS-009

#### JSAE Standardization Activities Update

**Masaki Hayakawa**

Akebono Brake Industry Co.,Ltd

**Shigeru Sakamoto**

Toyota Motor Corporation

**Masato Yamaguchi**

Nissan Motor Co., Ltd

**Yuzo Todani**

Mazda Motor Corporation

**Naoki Hata, Tatsushi Ishikawa**

ADVICS CO.,LTD.  
Japan

### Discussion - "Do we need new Standard Test Procedures, Obsolete old Procedures?"

#### Moderator:

**Dr. Jaroslaw Grochowicz** – Ford Werke GmbH

Wrap-up, Next Steps



# Technical Programme

Wednesday 19 May 2021

09:00 – 10:40 **Technical Sessions**

## BEM1 – Brake Emissions Macroscopic Part 1

Chair: **Dr. Theodoros Grigoratos**

European Commission,  
Joint Research Centre

Co-chair: **Parimal Mody**

Automotive Brake and Friction Expert

EB2021-EBS-003

### Influence of the Run-in Methodology on the Particle Number Emission of Brakes

**Katharina Kolbeck**

BMW/ TU Ilmenau

**Matthias Bernhard, Thomas Schröder**

BMW

**Dr. David Hesse, Prof. Dr.-Ing. Klaus Augsburg**

TU Ilmenau

Germany

EB2021-FBR-002

### Study on the Brake Particle Emissions of Various Friction Materials

**Shotaro Imai, Katsuya Okayama, Koji**

**Sugimoto, Noriko Matsunaga**

ADVICS CO., LTD.

Japan

EB2020-STP-018

### Experimental Validation of the PMP Air Cooling Adjustment for Brake Emissions Measurements

**Carlos Agudelo, Dr.-Eng. Ravi Teja Vedula, Quinn O'Hare**

Link Engineering Co.  
United States

**Dr.-Eng. Jaroslaw Grochowicz**

Ford Werke GmbH  
Germany

**Dr. Theodoros Grigoratos**

European Commission, Joint Research Centre  
Italy

EB2020-FBR-019

### Investigation of Brake Wear Particle Emissions from Different Disc Brake Friction Components and Urban Driving Cycles Using a JASO C 470 Methodology.

**Dr. Hiroyuki Hagino**

Japan Automobile Research Institute  
Japan

11:00 – 11:30 **Meet the Speakers**

## MMD – Materials, Manufacturing and Design (rail)

Chair: **Prof. Dr. Jiliang Mo**

Southwest Jiaotong University

Co-chair: **Dr.-Ing. Tim Hodges**

DRiV Inc.

EB2021-FBR-004

### The Effects of Structural Stiffness in Vibration Transmission Paths on Friction-Induced Vibration

**Dr. Qiang Liu, Prof. Jiliang Mo,**

**Dr. Zaiyu Xiang, Dr. Anyu Wang, Wei Chen, Honghua Qian**

Southwest Jiaotong University  
China

EB2021-EBS-011

### Railway Squealing Noise on Nordic Trains Application in Sweden

**Denis Emorine**

ALSTOM  
Germany

EB2021-STP-016

### Performance of Non-segmented and Segmented Railway Brake Discs - Temperatures, Wear and Fatigue Investigated by Field Experiments and Simulations

**Dr.-Eng. Mandeep Singh Walia, Bjarke Raaby**  
Green Cargo AB

**Dr.-Eng. Gaël Le Gigan**

Volvo Car Corporation

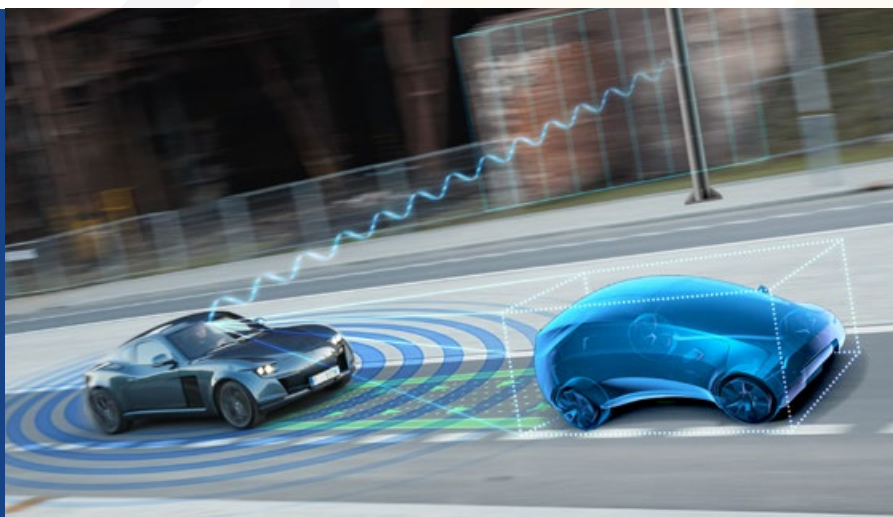
**Dr.-Eng. Tore Vernersson, Prof. Roger Lundén**

Chalmers University of Technology  
Sweden

11:00 – 11:30 **Meet the Speakers**

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FISITA World Congress  
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# Technical Programme

Wednesday 19 May 2021

11:30 – 13:10 **Technical Sessions**

## BEM2 – Brake Emissions Macroscopic Part 2

Chair: **Guido Perricone**  
Brembo S.p.A.

Co-chair: **Dr.-Ing. Sebastian Gramstat**  
Audi AG

EB2020-EBS-038

### Real-World Brake-Wear Emission Factors – California's Perspective

**Carlos Agudelo**

Link Engineering Co.

Jeff Long, Dr. Seungju Yoon, Dr. Sam Pournazeri, Dr. Jorn Herner, Dr. Sonya Collier  
CA Air Resources Board (CARB)

Alan Stanard, Sandeep Kishan  
Eastern Research Group (ERG)

Dr. Ravi Vedula, Radoslaw Markiewicz  
Link Engineering Co. (LINK)

Dr. Simon Bisrat, Jason Lee  
California Department of Transportation  
(Caltrans)

Chad Bailey, Dr. Michael Aldridge, Dr. Michael Hays, Dr. Bob Giannelli, Dr. Darrell Sonntag, Dr. Jeffrey Stevens  
U.S. Environmental Protection Agency (U.S. EPA)  
United States

EB2021-EBS-004

### Influence of Pad Retraction and Air Gap Width between Brake Disc and Pad on PM10 Wear Emissions During Cruising Conditions

**Hartmut Niemann, Prof. Dr. Hermann Winner**  
TU Darmstadt

Dr.-Ing. Christof Asbach, Heinz Kaminski  
Institute of Energy and Environmental Technology

Georg Frentz  
Daimler AG, Germany

EB2021-EBS-006

### Investigation of Particle Dynamics with Real Vehicles and Swarm Sensors

Prof. Dr.-Ing. Georg-Peter Ostermeyer, **Malte Sandgaard**, Guido LehneWandrey  
TU Braunschweig, Germany

EB2021-STP-004

### IT-Dimensions of Swarm-based Measurement of Particulate Matter

**Guido Lehne-Wandrey**, Jan Malte Sandgaard, Prof. Dr.-Ing. Georg-Peter Ostermeyer  
TU Braunschweig; Germany

14:00 - 14:30 **Meet the Speakers**

## NVHV – NVH Vehicle Applications

Chair: **Dr. Jay Fash**  
Zoox

Co-chair: **Dr. Torsten Treyde**  
ZF Group

EB2021-STP-011

### The Psychoacoustic Characteristics of Non-Linear Automotive Disk Brake Creep Groan: A Method Based on Accelerometer Data

Dipl.-Ing. Severin HuemerKals, **Máté Tóth**, Dipl.-Ing. Dominik Angerer, Dipl.-Ing. Manuel Pürscher, Federico Coren  
Graz University of Technology  
Austria

Prof. Jurij Prezelj  
University of Ljubljana  
Slovenia

**Martin Zacharczuk**  
Mercedes-Benz AG  
Germany

EB2020-STP-008

### Considerations about the Interaction between Brake Creep Groan and Squeal in Disc Brakes

**Narcís Molina Montasell**, Dr. Juan Jesús García Bonito, Amadeu Martorell Branchat, Ing. Fabio Squadrani  
Applus IDIADA  
Spain

EB2021-STP-015

### Brake Noise Detection Using Artificial Intelligence

**Ing. Fabio Squadrani**, Danilo Mendes Pedroso, Kenneth Mendoza, Dr.-Eng. Juan J. Garcia Bonito, Juan Pablo Barles, Antonio Rubio, Antonio Jesus Contreras, Jose Francisco Martinez  
Applus IDIADA  
Spain

EB2020-STP-003

### Brake Squeal Prediction Using Deep Learning

**Prof.-Ing. Merten Stender**, Nadine Jendrysik, Daniel Schoepflin, Prof. Dr. Norbert Hoffmann  
Hamburg University of Technology

Prof. Dr. David Spieler  
University of Applied Sciences Munich

Dr.-Ing. Merten Tiedemann  
Audi AG  
Germany

14:00 - 14:30 **Meet the Speakers**





# Technical Programme

Wednesday 19 May 2021



## Strategy Panel 2021

15:00 – 16:40 CEST

### Chassis Systems – a new approach to OEM and Tier 1 collaboration?

#### Chairs:

**Prof. Dr.-Ing Georg-Peter Ostermeyer** – TU Braunschweig

**Jan Münchhoff** – AUDI AG

This strategy panel discussion involving leading industry and academic experts will include consideration of the following:

- A new era of OEM-supplier collaboration
- Standardization – requirements and opportunities
- Supply chain evolution
- Scientific tasks and working fields
- Main interface challenges
- Outlook and future opportunities

#### Panellists:

**Manfred Meyer** – Senior Vice President Active Safety division, ZF Group

**Ulrich Schulmeister** – Vice President Systems Engineering Vehicle, Robert Bosch GmbH





**William Wei** – Chief Technology Officer, Foxconn Group

We will discuss these issues with our high-calibre panel of top experts and visionaries, making strategic issues transparent for all and supporting follow-up discussions during and after EuroBrake 2021.



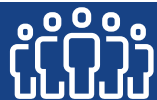
# Technical Programme

Thursday 20 May 2021

09:00 – 10:40 Technical Sessions		11:30 – 13:10 Technical Sessions
NVHF – NVH Fundamentals	STP – Simulation, Testing, Innovative Development Processes (rail)	BEML – Brake Emissions Microscopic Level
<p>Chair: <b>Dr. Jean-François Brunel</b> University of Lille</p> <p>Co-chair: <b>Prof. Dr. Ho Jang</b> University of Korea</p>	<p>Chair: <b>Prof. Raphael Pfaff</b> FH Aachen</p> <p>Co-chair: <b>Roberto Tione</b> WABTEC-Faiveley</p>	<p>Chair: <b>Yezhe Lyu</b> Lund University (LTH)</p> <p>Co-chair: <b>Dr. Hiroyuki Hagino</b> Japan Automobile Research Institute</p>
<p>EB2020-STP-017 </p> <p><b>Experimental and Numerical Investigation of C/C Material Unstable Friction Induced Vibration</b></p> <p><b>Ing. Alessandro Lazzari</b>, Simona Totaro, Dr.-Ing. Davide Tonazzi, Prof. Dr.-Ing. Francesco Massi University of Rome 'La Sapienza' Italy</p> <p><b>Prof. Dr.-Ing. Aurélien Saulot</b> INSALyon France</p>	<p>EB2021-FBR-005 </p> <p><b>Nonlinear Dynamic Analysis of CRH5 Disc Brake System</b></p> <p><b>Dr. Quan Wang</b>, Dr. Zhiwei Wang, Prof. Jiliang Mo Southwest Jiaotong University China</p> <p>EB2021-IBC-003 </p> <p><b>Simulation of Big Data from Railway Braking</b></p> <p>Simon Westfechtel, Prof. Dr. Ingo Elsen, <b>Prof. Dr. Raphael Pfaff</b>, Marcel Remmy FH Aachen Germany</p> <p>EB2021-IBC-004 </p> <p><b>Braking Curves in Railway Shunting and Implications for the Development of Sensor Systems for Autonomous Shunting</b></p> <p>Matthias Blumenschein, <b>Prof. Dr. Raphael Pfaff</b>, Katharina Babilon FH Aachen Germany</p> <p>EB2021-STP-010 </p> <p><b>Influence of System Boundary Condition on the NVH Behaviour of Bogie Brake Simulation</b></p> <p>Prof. Dr.-Ing. Georg-Peter Ostermeyer, <b>Andreas Krumm</b>, Dr.-Ing. Frank Schiefer TU Braunschweig</p> <p>Sebastian Montua Faiveley Transport Bochum GmbH Germany</p> <p>EB2021-STP-022 </p> <p><b>Acoustic Certification of New Composite Brake Blocks</b></p> <p><b>Dr.-Ing. Stefan Doersch</b>, Maria Starnberg, Dr.-Ing. Haike Brick DB Systemtechnik GmbH Germany</p>	<p>EB2020-EBS-031 </p> <p><b>Novel Approaches for Physico-Chemical Characterization of Brake Emissions</b></p> <p><b>Dr. Alessandro Mancini</b>, Dr. Sonia Pin, Bozhena Tsyupa, Dr. Federico Bertasi, Marco Bandiera, Dr. Matteo Federici, Dr. Andrea Bonfanti, Dr. Guido Perricone Brembo S.p.A.</p> <p><b>Prof. Ezio Bolzacchini</b> University of Milano Bicocca Italy</p> <p>EB2021-STP-002 </p> <p><b>Development of a Small-scale Test Bench for Investigating the Tribology and Emission Behaviour of Novel Brake Friction Couples</b></p> <p><b>Fabian Limmer</b>, Prof. David Barton, Dr. Carl Gilkeson, Dr. Peter Brooks, Dr. Shahriar Kosarieh University of Leeds United Kingdom</p> <p>EB2021-STP-005 </p> <p><b>The Variable Velocity Tribotester</b></p> <p>Prof. Dr.-Ing. Georg-Peter Ostermeyer, Alexander Vogel, <b>Jacek Kijanski</b>, Malte Sandgaard, Guido LehneWandrey TU Braunschweig Germany</p> <p>EB2021-STP-013 </p> <p><b>Particle Simulation and Metrological Validation of Brake Emission Dynamics on a Pin-on-Disc Tribotester</b></p> <p><b>Sven Brandt</b>, Malte Sandgaard, Prof. Dr.-Ing. Georg-Peter Ostermeyer, Prof. Dr.-Ing. Arno Kwade, Prof. Dr.-Ing. Carsten Schilde TU Braunschweig</p> <p><b>Dr.-Ing. Sebastian Gramstat</b> Audi AG</p> <p><b>Frank Stebner</b>, Conrad Weigmann Volkswagen AG Germany</p>
<p>EB2021-STP-021 </p> <p><b>Investigation of Disc Brake Pad Interface Pressure Distributions Using FBG Sensors</b></p> <p><b>Zicheng Wang</b>, Prof. Steve James, Prof. Marko Tirovic Cranfield University United Kingdom</p>		
<p>EB2020-STP-058 </p> <p><b>A Study on Brake Squeal Focusing on the Relationship Between Mode Coupling and Curve Veering</b></p> <p><b>Hayuru Inoue</b> Hitachi Astemo Japan</p>		
<p>EB2021-STP-006 </p> <p><b>Structured Light 3D Sensor for Fast and High Precision Surface Dynamics Measurements</b></p> <p>Prof. Dr.-Ing. Georg-Peter Ostermeyer, <b>Chengyuan Fang</b>, Guido LehneWandrey, Malte Sandgaard, Alexander Vogel, Jacek Kijanski TU Braunschweig</p> <p>Thomas Hillner, Fabian Repetz Wenglor Sensoric GmbH Germany</p>		
11:00 – 11:30 Meet the Speakers	11:00 – 11:30 Meet the Speakers	13:30 – 14:00 Meet the Speakers

# Technical Programme

Thursday 20 May 2021



14:00 – 15:40 CEST

Panel Session

## EuroBrake meets Shift2Rail

### Chairs:

**Johannes Gräber** – Knorr-Bremse

**Roberto Tione** – WABTEC-Faiveley

For the first time in 2021 we will hold a Rail Panel “EuroBrake meets Shift2Rail” to establish a closer cooperation with the major European Research Program Shift2Rail (<https://shift2rail.org/>).

We will start with an introduction to Shift2Rail by Carlo Borghini, Executive Director of the European Shift2Rail Joint Undertaking, with a particular focus on the evolution of automation in the European railway systems in order to maximize the performance of the current infrastructure in terms of capacity, lifecycle cost reductions and punctuality. In this respect, railway automation and digitalization rely on the performance and contributions of critical subsystems, where the braking systems have a major role. The R&I work started with a bottom-up technological approach in S2R has evolved during the years with the introduction of a system integrated approach, to ensure that all critical elements deliver together a functional performance that will contribute to deliver sustainable mobility, with rail playing a major role.

The Panel will then see three technical presentations from Wabtec, Knorr-Bremse and SNCF linked to research topics of Shift2Rail. The panel will be concluded with a Round Table discussion between Carlo Borghini and the presenters, moderated by Roberto Tione (Wabtec) and Johannes Gräber (Knorr-Bremse), with the audience given opportunities to ask questions, contribute to conclusions, and discuss future steps.

### Technical Presentations:

EB2021-IBC-009

#### Safe Deceleration Recovery in Degraded Braking Conditions

**Dr. Matteo Frea**

**Luc Imbert**

Wabtec

Italy

EB2021-IBC-010

#### Concept for Reproducible Braking Distance

**Dipl.-Ing. Michael Kohl**

Knorr Bremse SFS GmbH

**Dipl.-Ing. Christopher Lozano**

Knorr Bremse Systeme für Schienenfahrzeuge

GmbH

Germany

EB2021-MFM-004

#### Freight digital braking system, from the idea to the safety agreement. SNCF experiment

**Bertrand Minary**

Fret SNCF

France





# Technical Programme

Friday 21 May 2021

## 09:00 – 10:40 Technical Sessions

### BCN – Brake Control

Chair: **Manfred Meyer**  
ZF Group

Co-chair: **Claudio Prina**  
IVECO

EB2020-IBC-019

**Characterisation of the Objective Metrics Defining an Adaptive Cruise Control (ACC) and Comparison with the Subjective Assessment of Its Performance**

**Bernat Ferrer**

Applus IDIADA  
Spain

EB2021-IBC-002

**Analysis of Safety Relevant Wheel Individual Brake Torque Requirements for City EVs**

**Tobias Loss**, Dr.-Ing. Simon Peter,  
Dipl.-Ing. Armin Verhagen  
Robert Bosch GmbH

apl. Prof. Dr.-Ing. Daniel Görges  
TU Kaiserslautern  
Germany

EB2021-IBC-006

**Requirements and Test Cycles for Brake Systems of Autonomous Vehicle Concepts on the Example of an Autonomous Shuttle**

**Lennart Guckes**, Prof. Dr. Hermann Winner  
TU Darmstadt

Dr.-Ing. Jens Hoffmann, Sébastien Pla  
Continental Teves AG & Co. oHG  
Germany

EB2020-IBC-016

**Current Limits of Virtual Development for Brake Controls**

**Joachim Noack**

ZF Passive Safety GmbH  
Germany

EB2020-STP-068

**Designing Regenerative Brake Control Algorithms Using Simulation**

**Steve Miller**, Jan Janse van Rensburg  
MathWorks  
Germany

11:00 – 11:30 **Meet the Speakers**

### IRM – Innovative Raw Materials

Chair: **Eros Sales**  
ITT Motion Technologies

Co-chair: **Fernao Persoon**  
Lapinus

EB2020-MDS-003

**Correlation between Friction Performance and Tribolayer Formation Using Engineered Mineral Fibres**

**Dr. Neomy Zaquen**, Arno Kerssemakers,  
Fernao Persoon  
Lapinus  
Netherlands

EB2020-MDS-036

**Spherical Molybdenum Disulfide (SMD) in Brake Pads Applications**

**Dr. Yakov Epshteyn**, Lawrence Corte  
Climax Molybdenum  
United States

EB2021-FBR-003

**Determination of the Influence of Metal Sulphides on the Tribofilm and the Friction Behavior**

**Gabriela Macías**, Dr. Carlos Lorenzana  
Rimsa Metal Technology S.A

Prof. Dr. Javier Fernandez  
University of Barcelona  
Spain

EB2021-MDS-004

**The Effect of Chopped Steel Fibre Orientation on Frictional Properties in a Phenolic Resin-based Asbestos-free Semimetallic Friction Material**

**Dr. M.A. Sai Balaji**, Eakambaram Arumugam  
B S Abdur Rahman Crescent Inst. of Science & Technology

**S. Habib Rahmathulla**, H. Sultan Navid  
Indian Friction Material Engineering Company

**P. Baskara Sethupathi**  
SRM Institute of Science and Technology  
India

11:00 – 11:30 **Meet the Speakers**

## 12:00 – 13:40 Technical Sessions

### ART – Advances in Rotor Technology

Chair: **Prof. David Bryant**  
University of Bradford

Co-chair: **Dr. Enda Claffey**  
Bentley

EB2021-MDS-002

**Alumina-coated Brake Discs with Intention for Reduced Non-exhaust Emission and Increased Ride Comfort of Electrical Vehicles**

**Prof. Dr. Xueyuan Nie**, Ran Cai,  
Jingzeng Zhang  
University of Windsor

**Dr. Jimi Tjong**  
Ford  
Canada

EB2021-MDS-012

**The Prospects of Lightweight SICAlight Discs in the Emerging Disc Brake Requirements**

**Dr.-Eng. Samuel Awe**, Adam Thomas  
Automotive Components Floby AB  
Sweden

EB2020-STP-057

**Physical Background for Experimental Brake Disc Identification**

**Prof. Dr. Peter Blaschke**, Daniel Alarcon  
THWildau  
Germany

14:00 – 14:30 **Meet the Speakers**

# Technical Programme

Friday 21 May 2021

12:00 – 13:40 **Technical Sessions**

## HPP – High Performance Products

Chair: **Dr. Andrew Smith**  
Alcon Components Ltd.

Co-chair: **Alessandro Monzani**  
Brembo S.p.A

EB2020-EBS-017

**Design and Optimization Method for a High-Power Eddy Current Brake with a Magneto-isotropic Material Structure for the Use in Electrified Heavy Duty Trucks**

**Christoph Holtmann**

German Aerospace Centre (DLR)  
Germany

EB2020-STP-065

**State of Art Brake Systems in Motorsport**

**David Clegg, Garry Wiseman, Dr. Andrew Smith**

Alcon Components Limited  
United Kingdom

EB2020-STP-069

**Potential and Challenges for Application-specific Friction Characteristics of Race Brake Pads**

**Ing. Xabier Ugarte, Dipl.-Ing. Jürgen Voigt**  
TMD Performance GmbH

**Ing. Daniel Heiderich**  
Ruhr West Institute of Applied Sciences  
Germany

14:00 - 14:30 **Meet the Speakers**



SIA Powertrain & Power Electronics Conference & Exhibition  
9-10 June 2021 Online  
<https://join.fisita.com/SIA-power-train-electronics>

 **International Conference and Exhibition**  
9 - 10 June 2021

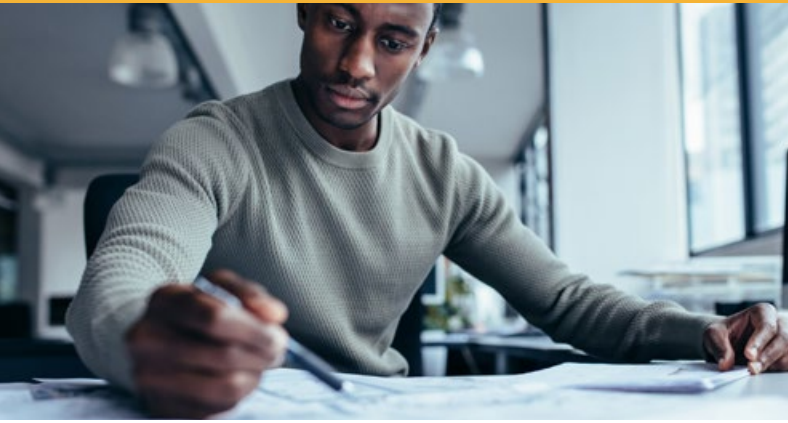
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**SIA POWERTRAIN & POWER ELECTRONICS**

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for Next Decade Low Carbon Mobility



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# EuroBrake Student Opportunities Programme (ESOP) 2021 Overview

## All times in CEST

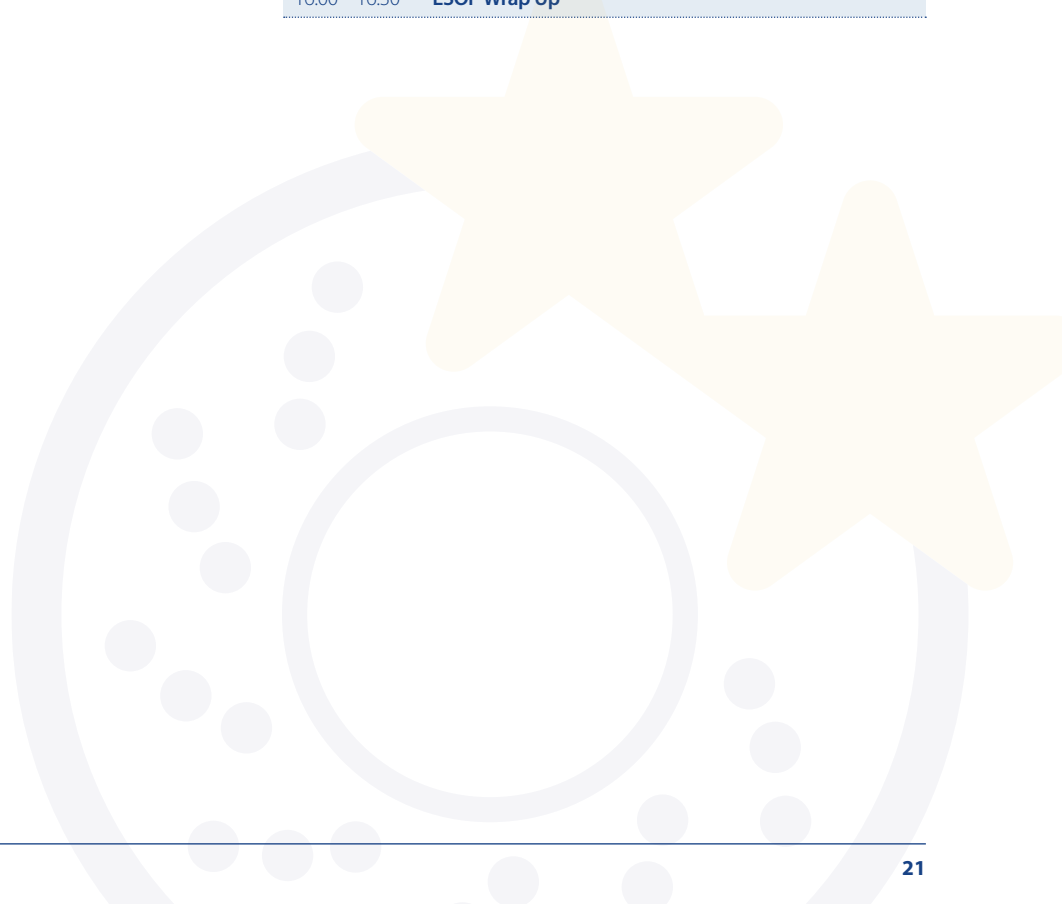
Monday 17 May	
09:00 – 09:30	ESOP Introductory Session
11:00 – 12:00	ESOP Q&A
14:30 – 15:00	ESOP Introductory Session
17:00 – 18:00	ESOP Q&A

Tuesday 18 May	
10:00 – 11:00	ESOP Round Table 1
10:00 – 11:00	ESOP Surgery Session 1
17:00 – 18:00	ESOP Round Table 2
17:00 – 18:00	ESOP Surgery Session 2

Wednesday 19 May	
08:00 – 09:00	ESOP Round Table 3
14:00 – 15:00	ESOP Round Table 4
14:00 – 15:00	ESOP Surgery Session 3
17:00 – 18:00	ESOP Surgery Session 4

Thursday 20 May	
08:00 – 09:00	ESOP CV Session 1
16:00 – 17:00	ESOP CV Session 2

Friday 21 May	
15:00 – 16:00	ESOP CV Session 3
16:00 – 16:30	ESOP Wrap Up







# EuroBrake Student Opportunities Programme 2021

**The EuroBrake Student Opportunities Programme (ESOP) offers students from around the world the chance to participate in EuroBrake. ESOP 2020 successfully went virtual, and we were delighted to have selected 50 students, from over 100 applications from students worldwide, who joined us for the online programme. Undergraduate and postgraduate students participated, with disciplines ranging from mechanical engineering to management to computational modelling and simulation.**

ESOP 2021 will once again offer students with a passion for mobility the unique chance to network with and learn from international braking and engineering experts. ESOP sessions will take place via Microsoft Teams during the week of 17-21 May, alongside the main EuroBrake event online.

In advance of the ESOP sessions, we share a number of pre-recorded videos from braking experts for the students to watch and resources to read, in order to join ESOP with some of the key information they need. In addition to ESOP sessions, students are encouraged to join the main EuroBrake sessions just as they would if we were at the onsite event, to learn about the trends and topics within braking and network with exhibitors, delegates and speakers.

The ESOP package for students includes:

- ESOP Introductory Session
- ESOP Q&A
- Round Table Sessions
- Surgery Sessions – led by Dr. Martin Haigh, Latitude 7
- CV Sessions
- ESOP Wrap-up

Thanks to the ESOP Working Group, with support from the EuroBrake Steering Committee and several international braking and mobility experts for their time and efforts to ensure we continue our dedication to supporting the next generation of mobility engineers and welcome a group of motivated young engineers to the braking community every year.





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